

國科會計畫

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全像分光光學元件於立體視覺顯示之應用 (II)

The Study of Holographic Optical Elements for Stereoscopic Vision (II)

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中文摘要

本年度計畫目的是發展一具有開關功能的全像分光元件以供液晶面板達成平面視覺與立體視覺可相互切換的顯示功能。整體計畫構想書為三年期計畫且將依序分三年執行，本年度計畫書內容為三年期計畫中的第二年計畫。第二年計畫則是延續前一年度材料與元件的研發成果與經驗，設計出可利用電壓做開關調制的全像分光元件，與前一年度計畫內容不同之處在於第一年度著重全像分光元件的光學特性，若將之套用於液晶面板則液晶面板則成為一固定式的立體顯示面板，而本年度計畫將擴充此全像分光元件之功能，研究其電壓驅動特性，藉由施加電場與繞射效率的關係，找出適當的驅動電壓以控制元件的繞射效率，進而製造出一開關式的全像分光器，若將之套用於液晶面板則液晶面板則成為一 2D 與 3D 顯示功能可切換的顯示面板。目前利用液晶面板為基礎的 3D 光學顯示系統仍是目前產業界最感興趣也咸信是生產成本最低的立體顯示技術，將全像元件應用於液晶顯示面板且要讓 3D 影像達到逼真、細緻、高亮度的要求，其必要條件是必須製作繞射效率高的全像分光元件，而繞射效率高低與否與記錄材料的特性息息相關，因此本計畫的實施將自行研發新穎的全像紀錄材料以製作全像分光元件；本計畫欲開發的材料將以液晶材料為主體，在其中摻雜高分子或染料分子以形成複合材料，其後利用全像的干涉記錄機制探討其施加電場與繞射特性之關係進而調整製程開發出最適合製作全像分光元件的記錄材料。

關鍵字：全像光學元件；全像記錄材料；液晶材料；3D 顯示

Abstract

The project in this year is to develop an electrically controllable holographic beam splitter for liquid crystal panels to generate a stereogram. We have proposed a three-year project. The project in this year is to implement the research arranged in the second year duration within the whole three-year project. Currently, the 3D display system based on liquid crystal panel is an attractive technique to create a stereogram owing to the low-cost for production. To generate a stereogram on liquid crystal panel, a beam splitter is essentially required. To implement the purpose, we have to generate a holographic optical element with high diffraction efficiency. Because the diffraction efficiency of a holographic optical element strongly depends on its recording material, we will develop new holographic materials based dye doped liquid crystal films to fabricate a holographic optical element with high diffraction efficiency. The layout of the beam splitters based on holographic optical element have to be designed and fabricated to match the pixel size and pixel pitch of the liquid crystal panel. We will study the relationship between applied field and diffraction efficiency of the holographic optical element. With the applied electric field on the holographic optical element, the diffraction efficiency of can be controlled. And then a 2D and 3D switchable display system can be presented.

Key words : Holographic optical elements; Holographic material; Liquid crystal; 3D display